

marine radio-telegraphist. Detailed instructions are given as to the methods of adjusting the various standard Marconi sets. Descriptions are also given of the apparatus of the Telefunken and Radio-Communication Co. The diagrams are very clear and the tables, rules, instructions, etc., included have been well selected.

(3) As the bulk of the world's radio-communication is carried on by continuous wave (C.W.) systems, it is natural that there should be a demand for elementary but accurate descriptions of these systems. The number of C.W. arc stations now exceeds a thousand, and more than 10,000 kilowatts have been installed for their operation. There are also many high frequency and valve generator stations. As space is limited in this booklet, some of the descriptions of important methods are too brief to be of much help to the reader, and there are notable omissions. The chapters on the advance of the C.W. system and on the Poulsen arc are instructive and contain novel matter. We can commend the book.

Plant Morphology and Physiology.

Practical Plant Biology: A Course of Elementary Lectures on the General Morphology and Physiology of Plants. By Prof. H. H. Dixon. Pp. xi+291. (London: Longmans, Green and Co., 1922.) 6s.

A TEXT-BOOK by such an experienced teacher as Prof. H. H. Dixon is very welcome. To judge from the introduction, this book represents in condensed form the series of lectures which the author has found most suitable for the introduction of his subject to a class in which medical students predominate. At the end of each lecture brief notes are added as to the scope of the practical work to be carried out in conjunction with the course. Each lecture occupies on the average about eight pages, and in the thirty lectures a wide series of types are covered, from unicellular forms to the flowering plant. Considerable physiological work is included, and the subjects of nuclear division, heredity, and evolution occupy the last three lectures. The treatment is therefore of necessity much condensed, and an elementary student would find it difficult to use the book except under guidance.

Three salient features in the book have impressed the present reviewer. The first is the interest and charm with which the author's style and personality invests the subjects of the elementary course. It is clear that each time Prof. Dixon renews his acquaintance with these familiar plants, his class will find him filled with the enthusiasm of a first encounter. The student cannot forget that he is studying living plants,

even when examined in the remote region of a "microscopic field." With the aid of a "ghost micrometer," an instrument Prof. Dixon demonstrated to Section K of the British Association for the Advancement of Science at Edinburgh last year, comparative data as to size, rate of movement, etc., are always kept before the student. The brief instructions given on p. 74 for practical work with *Spirogyra* provide an excellent example of how to make a student realise that *Spirogyra* is a living object in a three-dimensional world, and not a design transferred from the plane of the microscopic image to the plane of the paper. The second striking point is that the author has found it advisable to build up a knowledge of the plant by progress from the simpler unicellular forms to the more complex vascular plants. The initial difficulty of the unfamiliarity of the plant forms thus first introduced to the student is grappled with most successfully, and very interesting use is made of the opportunity thus provided, at an early stage of the course, of indicating the great practical and human significance of biological studies. On the other hand, this method of approach appears to make the treatment of plant physiology more disconnected and less experimental. Photosynthesis appears fairly early in the course, but the experimental treatment at this stage does not encourage any effort to associate the process with gain in dry weight and in carbon content. Respiration is discussed first as an anaerobic process with yeast, and later is treated more generally under *Chlamydomonas*. While some general questions as to the water relations of the cell appear in Lecture II., root pressure and translocation, hinted at in Lecture XIX. on the fern, are not fully treated until Lecture XXV.

Coming to the third point of interest, as might be anticipated from the author, a much wider use is made of relatively complex data from physics and chemistry than is usual in an elementary botanical text-book. If botany is to progress this seems to be an essential development, even if it implies ultimately a recognition that elementary botany courses need building upon the physics and chemistry of the final years of the graduate science course! Lecture II. introduces us to diffusion and osmosis, Lecture III. to phenomena of the colloid state, Lecture IV. to enzyme action and surface phenomena in heterogeneous systems. This pace is rather sweeping and makes great demands upon the student. It is probably also inevitable that as botanists venture into these paths, the pioneers will stumble occasionally in their unfamiliar surroundings. The attempt to define the difference between a gel and a sol on p. 22 appears to be a case in point. The explanation here given of the structure of a gel would render the phenomena of diffusion in

such gels entirely unintelligible, and the experiment illustrating the retention of congo red by a gelatin gel must receive quite another explanation than that given to it.

The Development of Vertebrates.

Traité d'embryologie des vertébrés. Par Prof. A. Brachet. Pp. xvi+602. (Paris: Masson et Cie., 1921.) 60 francs net.

FOR a remarkably clear and well-illustrated account of the development of the vertebrates the student could not do better than turn to this text-book from the pen of the distinguished professor of the University of Brussels. The information given is thoroughly up-to-date, the conclusions for the most part convincingly supported by an abundance of facts marshalled with great skill. While the author does not hesitate to discuss controversial questions, yet this treatise is strikingly free from prejudice, and none the less interesting because it deals for the most part with matters of fact. We find none of the fantastic phylogenetic interpretations of developmental stages according to the recapitulation theory which disfigure so many general text-books of embryology.

Naturally, in a single volume of some 600 pages, the whole range of vertebrate embryology cannot be covered in detail, and it is the early stages and germ-layer formation that receive particular attention. We know of no text-book in French or English with such a lucid account of these complex processes in the vertebrates. By skilful selection and the omission of unimportant detail Prof. Brachet also provides good descriptions of the development of the chief organs. The development of the cranial nerves, for instance, is particularly well presented.

There are some points on which the author is not convincing, and on which his conclusions might, we think, be revised and modified. In the account of the mesoblastic somites of the head, like so many other embryologists, he uncritically adopts van Wijke's scheme of enumeration, which inevitably leads to confusion in the region of the hyoid arch, instead of Balfour's system. We are unable to understand his reluctance to admit that in vertebrates above Amphioxus there are still traces of the formation of mesoderm from enterocoelic pouches, and we consider that he attaches too much importance to what he terms acrogenesis, cephalogenesis and notogenesis, a distinction which seems somewhat artificial and founded on certain specialisations of growth in the embryos of higher forms. Nevertheless, Prof. Brachet's volume is an excellent treatise, and will be heartily welcomed by students and teachers of embryology.

NO. 2756, VOL. 110]

Our Bookshelf.

The Principle of Relativity. Original Papers. By A. Einstein and H. Minkowski. Translated into English by M. N. Saha and S. N. Bose. With a Historical Introduction by Prof. P. C. Mahalanobis. Pp. xxiii+186. (Calcutta: University of Calcutta, 1920.)

THE book under review begins with an interesting historical account of the experiments dealing with the elucidation of the æther-idea in physics, and we are led through the work of Michelson and Morley, Lorentz and others to a brief account of Einstein's theory of relativity and some of the results obtained with its aid. The second section reproduces Einstein's original paper "On the Electrodynamics of Moving Bodies" (*Annalen der Physik*, 1905), and this is followed by a short note on Albrecht (!) Einstein and the various phases of his scientific activity. The next section on the "Principle of Relativity" is apparently a translation of Minkowski's paper on "The Fundamental Equations for the Electromagnetic Processes in Moving Bodies" (*Göttinger Nachrichten*, 1908), though no reference is given, and the title is omitted. An appendix to this is given, and it concludes with the well-known lecture of Minkowski on "Space and Time," delivered to the German Naturforscherversammlung at Cologne (1908), and published in the *Physikalische Zeitschrift* (1909) and in "Das Relativitätsprinzip," a collection of papers by Lorentz, Einstein, and Minkowski (Teubner, 1913). The sixth section of the book consists of Einstein's monumental work on the "General Theory of Relativity and Gravitation" (*Annalen der Physik*, 1916), and the concluding section brings a number of explanatory notes, mostly mathematical, on special points.

The translation cannot be called a good one. In a work of this kind we expect a fairly literal translation, but in the present book there are numerous errors in translation, and the choice of English equivalents for German words is frequently unfortunate. In many instances the mathematics is faultily reproduced. The numbering of the pages is not continuous, but recommences at the beginning of section 4, and the omission of the footnotes from the originals is regrettable. Provided it is studied with care, the translation will nevertheless be of service to those who are unfamiliar with German, and wish to grapple with the pioneer works on this subject, some of which are rather inaccessible.

A Little Book on Water Supply. By Dr. William Garnett. Pp. xv+144. (Cambridge: At the University Press, 1922.) 6s. 6d. net.

"THIS little book when in manuscript was condemned by a very high authority on educational publications, for it did not enable the reader to prepare for any specific examinations." So the preface begins. But was not the very high authority anxious to be kind? We, too, are inclined to condemn the little book as an educational work, not because it is useless for examinations, but because it lacks a coherent plan.

There is no attempt to group the portions of letterpress into chapters. General statements are sand-